Order of differential Equation:- The order of a differential equation is the order of the highest derivative that appears in the equation.

Degree of differential Equation:-The power of that highest order derivative term is order of differential equation .remember that power is always a whole number.

Formation of differential Equation:-

Number of constant =order of differential Equation.

The differential Equation which is free from constant ,if equation contain 1 constant then take derivative one time and eliminate constant.

If 2 constant then take derivative 2 times and eliminate constant. Likewise.

Types of Differential Equation:-

1)variable separable Equation:-

$$\frac{dy}{dx}=\frac{f(x)}{g(x)} or \frac{dy}{dx}=\frac{g(x)}{f(x)}$$

The equation in which variable are separated easily is called variable separable differential Equation

2) Differential Equation reducible to variable separable form:-

$$f(x \pm y), f(xy), f(y/x), f(x/y)$$

Put u=f(?).

3) Homogeneous Differential Equation:

Form :-Mdx+Ndy=0& $\frac{dy}{dx} = \frac{M}{N}$

Each term containing same degree(power).

4)Non Homogeneous:-

Form :- $\frac{dy}{dx} = \frac{a1x+b1y+c1}{a2x+b2y+c2}$ and in which $\frac{a1}{a2} = \frac{b1}{b2}$

5)Exact Differential Equation:

Form Mdx+Ndy=0& $\frac{dy}{dx} = \frac{M}{N}$

Condition of Exactness:- $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

Solution can be obtained by

$$\int M\,dx + \int N\,dy = c$$

Not Exact :- $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$

Rules for Integrating factors of the equation

Mdx+Ndy if it’s not exact:-

Rule1:If given differential Equation Homogeneous:-

Then, I.F= $\frac{1}{\text{Mdx+Ndy}}$

Rule1:If given Equation has the form

y.f(xy)dx+xf(xy)dy=0

Then, I.F= $\frac{1}{\text{Mdx}-\text{Ndy}}$

Rule 3:if $\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}=f(x)$

Then I.F.=$e^{\int f(x)dx}$

Rule 4:if $\frac{\frac{\partial N}{\partial y}-\frac{\partial N}{\partial x}}{M}=f(y)$

Then I.F.=$e^{\int f(y)dy}$

6) Linear differential Equation:-

Form 1:Linear In y

$$\frac{dy}{dx}+py=Q$$

Then I.F=$e^{\int pdx}$ $therefore\ the\ G.S.is$

$$ye^{\int pdx} = \int Q.e^{\int pdx} + C$$

Form 2:- Linear in x,

$$\frac{dx}{dy} + px = Q$$

Then I.F=$e^{\int pdy}$ $therefore\ the\ G.S.is$

$$ye^{\int pdy} = \int Q.e^{\int pdy} + C$$

7) Bournoulli's differential Equation:-

Form 1:

$\frac{dy}{dx} + py = Q$yn then Solution :-

1)Divide by y^n we get ,

$y\frac{dy}{dx} + py = Q$//not complete

Then put u=y^{n-1}

Diff.u.w.r. to x,

(1-n)$y^{-n}\frac{dy}{dx} = \frac{du}{dx}$

$$\frac{1}{(1-n)}\frac{du}{dx} + p.u = Q$$

To make equation linear in u,

Multiply both side by (1-n) then we get,

$$\frac{du}{dx} + (1-n)P.u = (1-n)Q$$

Now Equation is linear in u

Form 2:

$\frac{dx}{dy} + px = Q$y^n then Solution :-

1)Divide by x^n we get ,

$x\frac{dx}{dy} + px = Q$//not complete

Then put u=x^{n-1}

Diff.u.w.r. to x,

(1-n)y$^{-n}\frac{dy}{dx} = \frac{du}{dx}$

$$\frac{1}{(1-n)}\frac{du}{dx} + p.u = Q$$

To make equation linear in u,

Multiply both side by (1-n) then we get,

$$\frac{du}{dx} + (1-n)P.u = (1-n)Q$$

Now Equation is linear in u.